

#### REMARKS

Claims 30 and 33-36 have been rejected under 35 USC 112, first paragraph, based on alleged new matter in claim 30. This new ground of rejection was not necessitated by applicant's amendments since, as noted below, the rejection is not well taken and should not have been made. Applicant therefore requests that finality of the action should be withdrawn.

Claims 41-47 have been amended to employ the term "cuprous oxide" consistently.

As noted above, the examiner has rejected claims 30 and 33-36 under 35 USC 112, first paragraph, based on alleged new matter in claim 30. Applicant requests that the examiner should reconsider and withdraw this rejection. There is support for reference to "dilute copper-free zinc sulfate solution" at page 15, lines 13-19 of the specification as originally filed.

The examiner has rejected claims 29-44 as being indefinite. Applicant has amended claim 29 to remove the examiner's specific objection to claim 29.

Applicant has amended claim 30 to specify that the concentration of the zinc sulphate solution is less than 30 g Zn/l. This amendment is supported by the disclosure in the sentence starting at page 6, line 8 that a concentrated zinc sulfate solution, as referred to in the specification, is a solution in which the zinc content is in the region of 30-200 g Zn/l. Consequently, a dilute zinc sulfate solution has a zinc content less than 30 g Zn/l.

Claims 29,31,32,37,38,40 and 44 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart in view of Owusu and Lindoy et al.

The disclosure of Stewart has been discussed in the reply to the previous Office Action.

The examiner relies on Owusu as disclosing that ion exchange may be employed for removal of copper from a zinc sulphate

solution. The only reference to ion exchange in Owusu is the sentence at page 2, lines 9-11:

Besides the zinc dust cementation process, other methods such as ion exchange, solvent extraction, molecular recognition technology, etc. could also be considered for impurity rejection.

Applicant submits that this sentence does not justify the examiner's broad reliance on the disclosure of Owusu, because none of the cited publications show removal of copper from a concentrated zinc sulphate solution. Specifically, the incidental reference to ion exchange as an alternative to zinc cementation does not justify the examiner's inference that Owusu suggests that the specific chelating alkyl-silylated silica-based ion exchanger of Lindoy et al should be used for copper removal.

Lindoy et al describes a method for preparing an ion exchanger that can be used for removing heavy metal ions from an aqueous solution without removing alkali or earth alkali metal ions such as the ions of sodium, potassium, calcium and magnesium. The examiner asserts that Lindoy et al also discloses that the ion exchanger is most selective toward copper and is selective for copper over zinc. The table in Example 3 of Lindoy et al shows that most of copper has been bound to the ion exchanger. If the metal loading for zinc was the same as for copper, then about 75% of the zinc has been bound to the ion exchanger. Since Lindoy et al discloses that the ion exchanger removes most of the copper and most of the zinc, applicant submits that Lindoy et al does not show an ion exchanger that has selectivity between zinc and copper but only between heavy metal ions and alkali metal ions. No commercial zinc process can use Lindoy et al for copper removal if it removes also most of zinc. In addition the aqueous solution of Lindoy et al is a nitrate solution and not a sulphate solution as in the claimed subject matter. Lindoy et al gives no guidance as to what should be expected if the content of metal to be removed (copper, in the

case of the claimed subject matter) differs significantly from that of the other metal to be retained in the solution (zinc).

Applicant submits that the disclosure of Lindoy et al cannot properly be combined with that of Stewart since Lindoy et al does not teach removal of copper from zinc sulphate solution but removal of any heavy metal from alkali metals.

In view of the foregoing, applicant submits that the subject matter of the independent claim 29 is not disclosed or suggested by the cited references, whether taken singly or in combination. Therefore, claim 29 is patentable and it follows that the dependent claims 30-44 also are patentable.

Claims 30, 33 and 36 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart in view of Owusu and Lindoy et al and further in view of Wolf et al.

Claim 30 specifies that the ion exchange stage may include alkaline pre-treatment.

Wolf et al relates to using of a Wofatit ion exchanger for removal of a small amount of an undesired metal from an aqueous salt of another metal. Specifically, Wolf et al discloses that Wofatit can be used to remove iron and chromium from a zinc sulphate solution. The zinc sulphate solution is passed through a column containing Wofatit-Zn and the Wofatit-Zn exchanges the Zn that is bound to the Wofatit with the iron and chromium present in the feed solution.

The prior art of record does not show that Wofatit can be used to bind copper and thereby remove copper from zinc sulphate solution. There is used as an example removing of iron and chromium from zinc sulfate solution but there is no mention about the range of the undesired metals. The pretreatment steps of the ion exchanger are washing first with hydrochloric acid (HCl), after that with distilled water and then directing 4 M zinc sulfate solution through the column so that at least a part of  $H^+$  ions of the hydrochloric acid are substituted with  $Zn^{2+}$  ions. There is no step of alkaline pretreatment. After these

pretreatment steps the zinc sulfate solution to be purified is fed to the column.

The examiner refers also in Wolf et al to second to last paragraph of page 3, which in applicant's opinion describes a normal pre-treatment of an ion exchanger and not using of pure solution without contaminants. In accordance with claim 30, the ion exchanger is first treated with alkaline solution then with copper-free zinc sulphate solution and only after that is the zinc sulphate solution to be purified fed into the ion exchange column. Applicant respectfully disagrees with the examiner's presumption that the concentrated zinc sulphate solution used in Wolf et al would also be copper-free since there is no reference to copper in Wolf et al. The examiner presumes that the zinc sulphate solution used for pre-treatment is dilute even though it is clearly said in the example that its concentration is same as that of the solution to be purified. Applicant submits that the examiner's assertion in connection with claim 33 that the zinc sulphate solution of Wolf et al has a pH of at least 2 is not supported by the record.

Applicant respectfully submits that a combination of Stewart, Owusu and Lindoy et al does not teach the claimed subject matter of claim 29 since Owusu lacks sufficient detail to be used in this connection and Lindoy et al does not teach that an ion exchanger can be selective between zinc and copper. Addition of Wolf et al does not teach any more since the ion exchanger is of totally different type and the record does not establish that it is capable of separating copper from zinc.

Claims 34 and 35 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart in view of Owusu and Lindoy et al and Wolf et al and further in view of Pike.

Pike relates to preparation of a chelate-exchange resin: there is mentioned that the resin can be used for removing heavy metal ions from mine leachate solutions, the heavy metal concentration being from 0.1 to 10 g/l. But the purpose of Pike is to remove all heavy metals, not certain metals only, from the

mine leachate solution. So Pike does not teach situations in which copper could be removed from a concentrated zinc sulphate solution.

Claims 39 and 41-43 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart in view of Owusu and Lindoy et al and further in view of Bodson.

Bodson is not relevant to the subject matter of claim 43 because Bodson does not teach that a part of the raw solution (zinc sulphate solution) is fed to a separate cuprous oxide precipitation stage and there copper on the solution made to react with zinc powder to form cuprous oxide that is routed to the chloride removal stage. Bodson has no bleed for cuprous oxide preparation from the raw solution. A major difference between Bodson and the present claimed subject matter is that in the present method, all the copper that is needed for chloride removal is taken from the raw solution (concentrated zinc sulphate solution) but all the needed copper in Bodson must be fed from outside.

Claims 45-50 and 53-54 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart in view of Owusu and Lindoy et al and Wolf et al and further in view of Bodson.

The examiner states that the independent claim 45 is a composite of claims 29, 30, 38, 39 and 40. Since claim 29 is patentable, it follows that claim 45 and the dependent claims 46-54 also are patentable.

Respectfully submitted,

/John Smith-Hill/

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